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A Background Report for the Formerly Utilized Manhattan Engineer District/Atomic Energy Commission Sites Program

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Assistant Secretary for Environment
Office of Environmental Compliance and Overview
Environmental and Safety Engineering Division
Washington, D C 20585

PREFACE

This report was prepared as part of the Department of Energy Formerly Utilized Sites Program, which was initiated in 1974 by the Atomic Energy Commission to determine the radiological condition of sites formerly used by the Manhattan Engineer District and the Atomic Energy Commission for operations involving radioactive materials. After the early 1940s, control of many sites no longer required for nuclear programs was returned to private industry or the public for unrestricted use. This is the first report summarizing the Department's efforts to identify the sites, characterize their conditions and, where appropriate, resolve any unacceptable radiological conditions.

A description of this program, a brief history of Manhattan Engineer District and early Atomic Energy Commission operations, and summaries of the current status of over 70 of the formerly utilized sites are contained in this report. The site-specific summaries, based on reviews of records, are not comprehensive histories of the sites, but are presented as an overview of site activities through June 1980. The summaries have been reviewed by owners and/or former owners, State representatives, representatives of the national laboratories, and persons cognizant of former nuclear operations, who have been instrumental in providing and verifying information. Supplemental reports will be published as required to document status changes and additional information regarding these sites or new sites.

I INTRODUCTION

The Department of Energy is conducting a program to determine radiological conditions at sites formerly used by the Army Corps of Engineers' Manhattan Engineer District and the Atomic Energy Commission in the early years of nuclear energy development The program is being administered by the Office of the Assistant Secretary for Environment through the Environmental and Safety Engineering Division, which is within the Office of Environmental Compliance and Overview. The sites of concern were federally, privately, and institutionally owned and were used primarily for research, processing of uranium and thorium ores, and storage of radioactive ores or residue Also included in the program are sites used in the Los Alamos plutonium development program and the Trinity atomic bomb test site The purpose of this background report is to provide a consolidated historical summary of these formerly utilized sites based on information collected to date

For the initial activities of the nuclear energy program, most of the uranium was extracted from foreign ores Pitchblende was imported, stored for short periods, transported to sampling plants in the East, and then transferred to mills and refineries for uranium extraction Some ores were also processed for thorium Much of the Government-sponsored research and development was centered at the national laboratories, with commercial firms producing the needed raw and finished material Ores were processed to obtain a mill concentrate that was then refined and converted to other uranium or thorium compounds or transformed into metal and distributed to other participants in the program Most of the metals manufactured from these various operations were ultimately transported to the Hanford site at Richland, Washington, for use in plutonium production Commercial firms also conducted operations to recover uranium from scrap and salvaged material

As a result of these activities, materials, equipment, buildings, and land became contaminated, primarily with naturally occurring radioactive nuclides. They were later decontaminated in accordance with the standards and survey methods in use at that time Since then, however, radiological criteria, guidelines, and proposed guidelines for release of such sites for unrestricted use have become more stringent as research on the effects of low-level radiation has progressed In addition, records documenting some of these decontamination efforts cannot be found, and the final radiological conditions of the sites could not be adequately determined from the records As a result, the Formerly Utilized Sites Program was initiated in 1974 to identify these formerly used sites and to reevaluate their radiological status.*

* Inactive uranium mill tailings sites in the Western States are being investigated under a separate program, as authorized by Public Law 95-604 (Uranium Mill Tailings Radiation Control Act of 1978)

Since 1974, a considerable amount of radiological site status information and records have been recovered or regenerated This report covers efforts through June 1980 to determine the radiological status of sites for which the existing conditions could not be clearly defined. Principal contractor facilities and associated properties have already been identified and activities are continuing to identify additional sites Any new sites located will probably be subcontractor facilities and areas used for disposal of contractor waste or equipment, however, only limited information regarding this equipment and material has been collected to date As additional information becomes available, supplemental reports will be published.

The purpose of assembling this historical data under a single cover is to provide a consolidated, quick-reference source for use at the program management level and to promote public participation in the program. This document also highlights unresolved questions, primarily on the location of disposal sites used during previous decontamination operations. Where available, information on the following is provided (a) type of activities conducted, (b) current site use and description, (c) ownership, and (d) radiological history and status

II. BACKGROUND

HISTORICAL RECORDS REVIEW

During the Manhattan Engineer District and early Atomic Energy Commission programs, principal efforts were directed at defense-related projects and involved technology to develop nuclear energy for military objectives Information regarding these activities was protected from public disclosure by defense security classification procedures At contract termination, sites used by contractors were decontaminated according to the criteria and health guidelines then in use The radiological criteria for releasing sites for unrestricted use were generally site specific and have changed over the ensuing years, in some cases, they are still not clearly defined It was thus necessary to reevaluate the current radiological conditions at these sites, and a records search was conducted

Changes in ownership and land use and the absence of licensing procedures prior to 1955 made locating the sites and defining their radiological condition difficult In addition, documentation relating to both site operations and decontamination activities was retired to Federal records storage centers and, in some instances, destroyed in accordance with Government records management practices The records search helped to identify the majority of formerly utilized sites but did not always generate sufficient information to characterize the radiological condition of every site. Other information found lacking in many cases included the location of contaminated materials, equipment, and process wastes removed from contractor facilities during operations and/or decontamination activities A site survey program was therefore initiated Efforts are continuing to determine the existence and location of any offsite disposition of contaminated waste materials

SITE SURVEY PROGRAM

In 1974, the Atomic Energy Commission's Division of Waste Management and Transportation initiated the survey program to identify all formerly used nuclear program sites and to determine their radiological status In mid-1974, the responsibility for this survey was assumed by the Division of Operational Safety At that time, all divisions and field offices of the Commission were requested to search their files for records documenting the current radiological condition of the sites, the conditions at the termination of Atomic Energy Commission activities, and land use and ownership, as well as for records identifying any additional sites This effort identified gaps in the information on sites recognized from the start of the program as well as on newly identified sites

In January 1975, the Energy Research and Development Administration assumed responsibility for the survey program The Administration's field office personnel contacted owners and coordinated site visits to determine the need for radiological surveys Press releases were issued to inform the public of the program and site status

Pursuant to the Department of Energy Organization Act of 1977, the functions and authority of the Energy Research and Development Administration were transferred to the Department The Environmental Control Technology Division (now Environmental and Safety Engineering Division) was assigned the responsibility for the site survey program Due to the importance of this effort, the Formerly Utilized Sites Program was formalized, and a generic plan for identifying and surveying sites and resolving any potential radiological problems was drafted

In mid-1979, using the generic plan as a guide, responsibility for the Formerly Utilized Sites Program activities was divided between the Assistant Secretary for Environment and the Assistant Secretary for Energy Technology (now Assistant Secretary for Nuclear Energy) The Assistant Secretary for Environment is responsible for identifying, characterizing, and ultimately certifying the radiological condition of the sites, the Assistant Secretary for Nuclear Energy is responsible for implementing required remedial actions and identifying disposal sites for residual radioactive material

OVERVIEW OF MANHATTAN ENGINEER DISTRICT/ATOMIC ENERGY COMMISSION ACTIVITIES

In 1942, under the jurisdiction of the Army, the Manhattan Engineer District was established as the lead agency in the development of nuclear energy The authority previously assigned to the Department of the Army's Office of Scientific Research and Development for process development, engineering design, materials procurement, and site selection associated with the program was transferred to the District District headquarters was originally established in New York City and, in 1943, was transferred to Oak Ridge, Tennessee

On December 31, 1946, the Manhattan Engineer District was deactivated and its responsibilities were transferred to the newly constituted Atomic Energy Commission At that time, more than ten prime contractors and several hundred subcontractors were involved in production and research operations These contractors included industrial concerns, universities, and other scientific organizations In contrast to the highly centralized operation of the Manhattan Engineer District, the Atomic Energy Commission decentralized and established five major centers of operation located in New York, New York, Santa Fe, New Mexico, Oak Ridge, Tennessee, Hanford, Washington, and Chicago, Illinois The Commission continued the Manhattan Engineer District practice of contracting with industrial concerns and academic institutions to perform the actual operations

The most readily available source of historical information on the early activities of Manhattan Engineer District and the Atomic Energy Commission is A History of the United States Atomic Energy Commission, Volume I - The New World and Volume II - Atomic Shield A synopsis of the procurement, storage, and processing of the raw materials containing uranium is presented in this report to give the reader a general overview of these activities The synopsis, although covering both Manhattan Engineer

District and Atomic Energy Commission operations, focuses on the District's operations and is limited to major contractors The formerly utilized sites program activities address all former Manhattan Engineer District and early Atomic Energy Commission sites, including facilities used by prime contractors and subcontractors and locations where equipment or radioactive materials used in nuclear operations were stored or disposed

All of the companies and locations in this overview were identified during the records review The companies are identified in Figure 1, a flow diagram showing the processing of uranium ores, tailings, or slimes into the finished product

Uranium Procurement

The Manhattan Engineer District relied on three sources of uranium during the war years About two-thirds came from mines in the Belgian Congo, slightly more than one-sixth from mines near Great Bear Lake in Canada, and the remainder from American ores, which in reality were tailings from vanadium refinery operations

African Sources--At the beginning of the nuclear program in the late 1930s and early 1940s, it was determined that although there were significant quantities of uranium ore available in Czechoslovakia and Canada, by far the most important sources were the mines of the Belgian Congo The supplies of ore in the United States were not considered extensive and, with the growing interest in uranium, Germany had ceased all sales of the Czechoslovakian ores As a result of this, plus the German takeover of Belgium and increased German activity in Africa, the United States, Great Britain, and Canada made an all-out effort to obtain as much of the Belgian Congo ore as quickly as possible to guarantee adequate supplies of uranium Through activities that began in September 1942, the United States was able to purchase all the aboveground supplies of uranium ore from the Belgian Congo This included 1200 tons of ore that had already been imported into the United States in 1940 by a Belgian Company, African Metals, Inc , and stored in the Archer-Daniels Midland Company warehouse (also known as the Staten Island Warehouse), Port Richmond, Staten Island, New York, plus some 3000 tons of similar ore still in the Congo By the end of 1944, the Manhattan Engineer District had received approximately 3700 tons of Congo ore * The amount of ore being received far exceeded the processing capacity in North America at that time The Manhattan Engineer District used three primary storage areas Seneca Ordnance Depot (also known as Seneca Army Depot), Romulus, New York, Clinton Engineer Works (now Oak Ridge National Laboratory), Clinton, Tennessee, and Perry Warehouse (Middlesex Sampling Plant), Middlesex, New Jersey

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x By the end of 1946, the Manhattan Engineer District had contracted for the extraction of approximately 3800 tons of U_3O_8 from over 29,000 tons of African ore containing from 5 to 65 percent uranium oxide

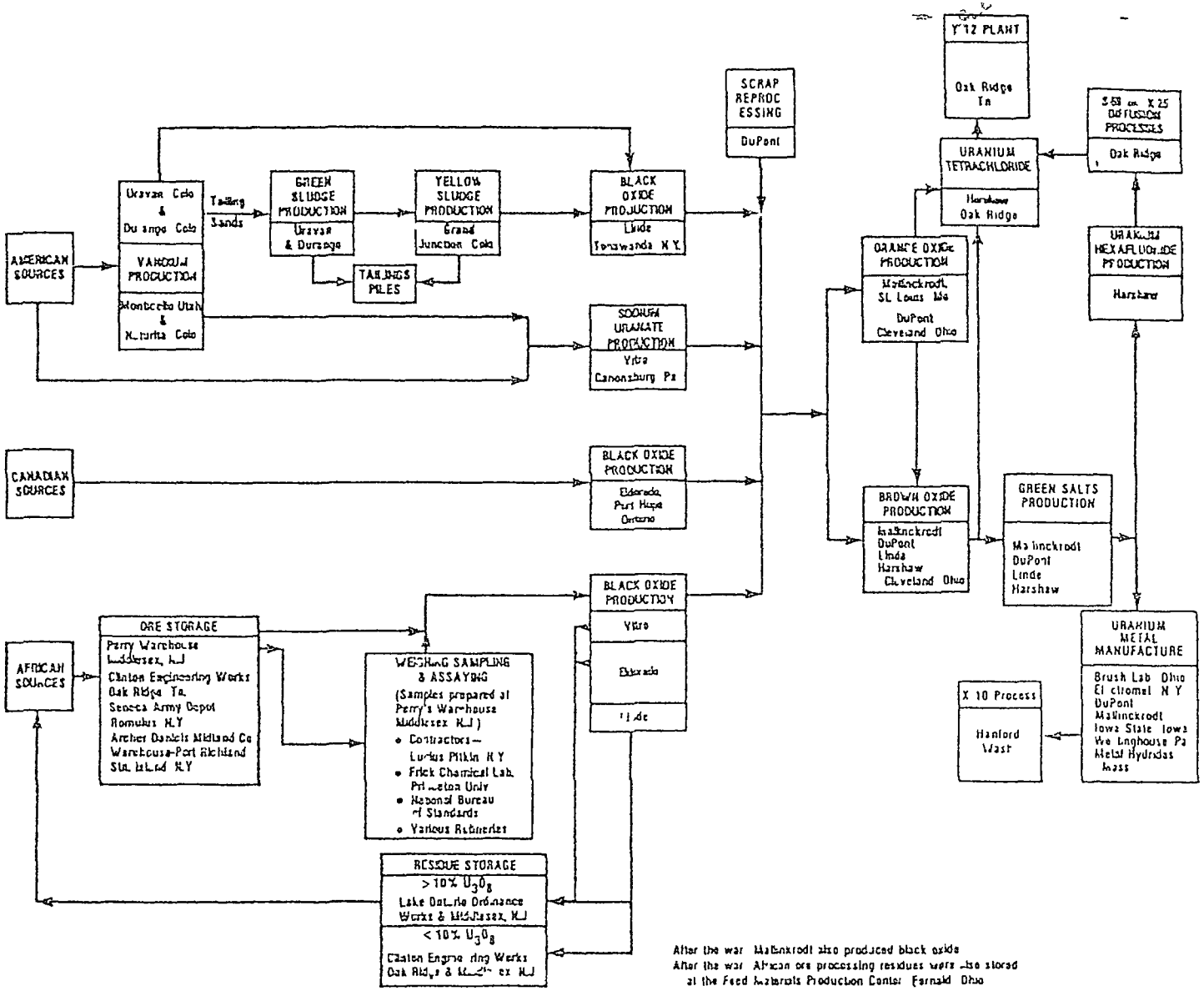

Figure 1 Processing of Uranium Ores, Tailings, or Slimes to Finished Processing by Various Companies

The Manhattan Engineer District contracts with African Metals, Inc , involved only the recoverable uranium oxide (U_3O_8, black oxide*) in the ore. African Metals maintained ownership of the residue or tailings, which contained radium and other precious metals As a result, it was necessary to establish weighing and assaying operations Initially, the weighing and assaying were performed at contractor facilities However, in November 1943, the Manhattan Engineer District set up a separate sampling program at the Perry Warehouse The assaying and weighing of the ore samples were perfor - ed for the Federal Government by Lucius Pitkin, New York, New York, Frick Chemical Laboratory, Princeton University, Princeton, New Jersey, and the National Bureau of Standards, Washington, D C. Assaying and weighing for African Metals, Inc , were performed by Ledoux and Company, New York, New York

Following weighing and assaying, the ore was shipped to the various refineries to be processed to black oxide or sodium uranate concentrates Because the tailings were owned by African Metals, the Manhattan Engineer District was required to store residues from these operations until they could be returned to the owner Those residues from ores containing greater than 10 percent U_3O_8 were stored at the Clinton Engineer Works or the Perry Warehouse before return shipment Residues from ores containing less than 10 percent U_3O_8 were stored at the Lake Ontario Ordnance Works, Lewiston, New York Some of the African Metals residues have been returned, some are still at the U S. storage sites **

Canadian Sources--The Office of Scientific Research and Development placed an order with Eldorado Gold Mines, Ltd (later Eldorado Mining and Refining, Ltd) to obtain uranium oxide refined from the Canadian ore Eldorado was to mine uranium ore at its Great Bear Lake mine and refine the ore at its facility at Port Hope, Ontario By 1944, about 400 tons of the oxide had been produced and enough Canadian ore had been mined to produce an additional 500 tons of the refined oxide By the end of 1946, over 4000 tons of ore concentrate containing over 1100 tons of U_3O_8 in the form of black oxide had been delivered to the District. Because the Canadian ore was processed to black oxide at the Eldorado facility and the entire concentrate was sold to the Government, no assaying and weighing program was set up for the Canadian ore

Domestic Sources--Most of the uranium in the United States was extracted from the carnotite ores of the Colorado plateau, however, the high-grade deposits had previously been mined primarily for their radium

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* The various steps of the uranium recovery and refining process produced concentrates and compounds of uranium oxide, which were generally referred to by their color and physical characteristics for nontechnical characterizations and for security reasons

** Some of the residues still in the United States are currently stored at the Feed Materials Production Center, Fernald, Ohio, as well as at the Lake Ontario Ordnance Works site

content The heavy demand for vanadium during the war created the potential for a practical source of uranium oxide as a byproduct of the vanadium processing However, the tailings from vanadium processing were of such low uranium content that it was necessary to concentrate them at or near the mine prior to their shipment to the processing facilities

The United States Vanadium Corporation concentrated vanadium tailings stockpiled at its Uravan, Colorado,* plant to produce a sludge containing 15 to 20 percent black oxide This sludge was sent directly to the Linde Air Products Company, Tonawanda, New York The Corporation also produced a green sludge (5 to 10 percent black oxide) from vanadium tailings and sands at its Uravan facility and another processing plant** at Durango, Colorado * The green sludge output from both facilities was trucked to Grand Junction, Colorado,* for the removal of vanadium and for further concentration of the uranium to produce yellow sludge (10 to 15 percent U_3O_8) This product was then shipped to the Linde facility

Concurrent with these operations, the Vanadium Corporation of America processed American ores for vanadium at its plants in Naturita, Colorado,* and Monticello, Utah Most of the slimes (50 percent U_3O_8 by weight) from these plants were shipped directly to the Vitro Manufacturing Company, Canonsburg, Pennsylvania, for processing A portion of the 50-percent slime tailings was sold to the Government and processed at the Uravan facility In addition to the United States Vanadium Corporation and Vanadium Corporation of America concentrates, similar materials, accounting for less than 8 percent of the domestic uranium oxides produced, were procured by the Government from various small operations By the end of 1944, domestic ore processing had yielded about 800 tons of uranium oxide and, by the end of 1946, concentrates containing over 1300 tons of uranium oxide had been produced from the domestic sources

Uranium Processing Operations and End Use

The initial concentrate refining operations consisted of mechanically grinding and crushing the ores to a sandy material Acid was used to dissolve the uranium The uranium-bearing acid solution extract was treated with other chemicals to precipitate the majority of impurities, and the uranium-bearing solution was further treated to precipitate the uranium The final products from this refining operation, either black oxide (U_3O_8) or yellow cake (sodium diuranate ($Na_2U_2O_7$) concentrate), were roasted and dried prior to the next stages of processing

* Uranium mills producing concentrates for uranium refining are covered under the Inactive Uranium Mill Tailings Program and are discussed in detail in "A Background Report for the Inactive Uranium Mill Tailing Sites Remedial Action Program," to be published by the Department of Energy

** A processing plant at Durango was operated by the United States Vanadium Corporation but was owned by the Metals Reserve Corporation

During World War II, the ores were refined to black oxides at the facilities of Linde and Eldorado Vitro (at Canonsburg) refined the ores to produce sodium diuranate Following the war, Mallinckrodt, Inc , also produced black oxide at its facilities in St Louis, Missouri, and later at the Atomic Energy Commission Weldon Spring Chemical Plant, Weldon Spring, Missouri

The black oxide and sodium diuranate were further refined to orange oxide (UO_3) and brown oxide (UO_2) The orange oxide was produced by Mallinckrodt and E I duPont de Nemours and Company, Deepwater, New Jersey At the DuPont plant, brown oxide was also made from black oxide and from uranium peroxide (UO_4 $2H_2O$) obtained from the processing of uranium-bearing scrap Brown oxide was also produced by Mallinckrodt, Linde, and Harshaw Chemical Company, Cleveland, Ohio. Brown and orange oxides were in turn refined into green salt (UF_4) by DuPont, Harshaw, Mallinckrodt, and Linde *

Harshaw made uranium hexafluoride (UF_6) from the green salt for the S-50 (thermal diffusion) and K-25 (gaseous diffusion) uranium-235 enrichment projects The Y-12 electromagnetic enrichment plant in Oak Ridge received orange oxide from the various producers along with partially enriched uranium hexafluoride from the S-50 and K-25 plants These feed materials were converted to uranium tetrachloride prior to enrichment at Y-12 Harshaw also supplied uranium tetrachloride for the Y-12 plant

Green salt and, in some cases, scrap metal were used in uranium metal manufacturing by DuPont, Mallinckrodt; Iowa State College (now University), Ames, Iowa, Westinghouse Electric Corporation, Bloomfield, New Jersey, Brush Beryllium Company, Cleveland, Ohio, and Electromet Corporation, Niagara Falls, New York Scrap metal recovery operations were conducted at Metal Hydrides, Inc , Beverly, Massachusetts, and Iowa State Uranium metal in the form of powder was also produced directly from uranium oxides instead of green salt by Metal Hydrides Various fabricators were contracted as required to develop fabrication techniques and form (rolling and machining) the metal The metal manufactured by the various companies was ultimately shipped to the Hanford site at Richland,

* Following World War II and after the construction of the Weldon Spring Chemical Plant, many of the Atomic Energy Commission uranium conversion operations were centralized and transferred to Weldon Spring, operated for the Government by Mallinckrodt, and later to the Feed Materials Production Center at Fernald, Ohio, operated by National Lead Company of Ohio The latter facility is currently a center for the processing of uranium and thorium ores and concentrates to useful compounds and metal shapes Other Department of Energy facilities at Paducah, Kentucky, Oak Ridge, Tennessee, and Portsmouth, Ohio, also have the capability to refine various uranium products

Washington, for use in plutonium production * Plutonium produced at Hanford was then shipped to Los Alamos, New Mexico, for use in the weapons development program

Quality control of the various processes in the ore/metal chain was performed by the University of Chicago, Metallurgy Laboratory, Chicago, Illinois, Princeton University, Massachusetts Institute of Technology, Cambridge, Massachusetts, and the National Bureau of Standards

In addition to the actual contractor-owned facilities, contractors used a number of offsite storage locations, such as landfills, for storing and disposing of their wastes Examples include the St Louis Airport Storage Site, where residue from Mallinckrodt operations was deposited, the former Haist property (now Ashland Oil Company), Tonawanda, New York, where material from Linde operations was deposited, the Pennsylvania Railroad Landfill Site, Burrell Township, Pennsylvania, where Vitro Corporation deposited wastes from the Canonsburg operation, and the Middlesex Municipal Landfill, Middlesex, New Jersey, where wastes produced during some construction activities at the Middlesex Sampling Plant were deposited Some private residences were also contaminated as a result of natural radionuclide migration or through the use of contaminated soil from these operations as fill material

Nuclear activities following World War II broadened in scope The Atomic Energy Commission entered into a number of research, development, and production contracts to recover uranium as byproducts of certain industrial processes such as phosphoric acid production In addition, contracts were terminated or established as product needs and research needs varied, hence, the number of formerly utilized sites exceeds the number of facilities shown in Figure 1 and discussed in this overview

Thorium Operations

Operations with thorium after the war were similar to the uranium operations but were conducted on a much smaller scale The first major research for the Manhattan Engineer District on thorium began early in 1946 with the procurement of thorium salts for a project at Iowa State College The thorium salts were supplied by Lindsay Light and Chemical Company,**

* An experimental gas-cooled pile and chemical pilot plant used to produce plutonium, called the X-10 process, was operated at Richland The initial development of the X-10 process was completed at Oak Ridge

** Lindsay Light and Chemical Company was using thorium for producing gas mantles, catalysts, and electron tube cathodes prior to its consideration for nuclear applications Remedial action activities at this site and associated properties are being undertaken by the State of Illinois and Kerr-McGee Chemical Corporation, under the regulatory authority of the Nuclear Regulatory Commission

Chicago, Illinois, which was the major supplier through most of the early years of the program Lindsay first received thorium from Germany and later processed monazite from India and Brazil In later years, processing studies were performed by Dow Chemical Company, Walnut Creek, California, as well as by Iowa State Extractive research, metal production and handling, and other research and development activities were conducted by a number of companies also involved in similar work with uranium, including Mallinckrodt, Simonds Saw and Steel, Lockport, New York, Sylvania orning Nuclear Corporation, Bayside, New York, Battelle Columbus vision, Columbus, Ohio, Brush Beryllium Company, and Horizons Metal, , Cleveland, Ohio The National Bureau of Standards was involved in quality control for the thorium programs, and the Middlesex Sampling Plant was used for storage of some thorium A major part of the current formerly utilized sites program effort is to ensure that all of the thorium sites have been identified and verified for radiological safety More in-depth records searches and interviews with former Atomic Energy Commission employees and other cognizant persons are being conducted

III. PROGRAM DESCRIPTION

OBJECTIVES

The purposes of the formerly utilized sites program are to identify former Manhattan Engineer District and Atomic Energy Commission sites, assess their radiological condition, decontaminate sites as required and authorized by Congress, and ultimately certify their acceptability for future use Sites are being identified through searches of existing Manhattan Engineer District and Atomic Energy Commission records and public assistance obtained through requests for information in press releases and letters

After a site has been identified, the responsibility for assessing its radiological condition is assigned to a national laboratory, which then reviews old radiological survey documents and performs radiological surveys as required A series of engineering studies and environmental reports, including any documents required by the National Environmental Policy Act, is prepared to evaluate remedial action alternatives After these evaluations, appropriate measures (remedial actions, if required) are selected and implemented to ensure public safety Following completion of these activities and a certification process, the former Manhattan Engineer District or Atomic Energy Commission site is cleared for unrestricted or restricted use, as appropriate

During the course of the investigation, press releases and public meetings serve to inform the public of the nature of the Government work done at the site, survey results, and remedial actions contemplated and undertaken Detailed reports of the survey findings are also published by the Department of Energy and are available to the public for a nominal fee

SCOPE

The scope of the Formerly Utilized Sites Program is confined to those public and private sites that were formerly used under contract to the Department of Energy or its predecessor agencies or owned by the Federal Government and controlled by these agencies These sites include those directly involved in the handling of radioactive materials for the Manhattan Engineer District and the Atomic Energy Commission and nearby properties contaminated by radioactive material originating from these activities. The materials processed consisted primarily of pitchblende, carnotite, or thorium ores and their refined or residue products Products included uranium and thorium metals and compounds The residue consisted of the process wastes, which generally contained low-level radioactivity due to the presence of components of the uranium and thorium radioactive decay chains that remained in the residues Included in the site list are the remains of two Chicago research reactors (Palos Park, Illinois), the site near the location of the Trinity atom bomb test (Chupadera Mesa, New Mexico), and other sites involved in the weapons development program (Los Alamos, New Mexico)

At the processing sites, the major contaminants are uranium, thorium, and radium and their radioactive decay products (daughters) Radium contamination is a major concern because its radioactive daughter, radon, is a noble gas that can diffuse into the air and be inhaled At the research reactor sites, the weapons development sites, and certain other research related facilities, nuclides such as plutonium, other transuranics, strontium, cesium, tritium, and uranium-235 are also potential contaminants

Throughout the program, emphasis has been on characterizing the radiological condition of the site itself Where onsite contamination has been found, the possibility of offsite radionuclide contamination has also been or is being investigated

APPROACH TO REMEDIAL ACTION

The approach to identifying and eventually correcting actual or potential conditions of radiological contamination at Manhattan Engineer District and Atomic Energy Commission sites entails two separate but interrelated efforts institutional activities and site characterization and remedial action related activities

Institutional Activities

Two important activities must be completed before the remedial actions can be performed

- Legislative authority must be established under which the Federal Government (Department of Energy) can act to correct problems of radiological contamination at formerly utilized sites Although the Department of Energy has authority at some sites, many will require new legislative authority Initiation of any required legislation is the responsibility of the Office of the General Counsel within the Department of Energy, with support from the Assistant Secretary for Environment and the Assistant Secretary for Nuclear Energy

- Radiological criteria must be developed for use as guidelines to determine if a radiological problem exists as well as to determine the extent of decontamination required at each site This activity will involve the Department of Energy as well as the Environmental Protection Agency and the Nuclear Regulatory Commission

Site Characterization and Remedial Action Related Activities

Although each formerly utilized site will have certain unique characteristics, a general sequence of events can be outlined that will lead to the program objective, which is to preclude any future radiological problems Figure 2 is a schematic presentation of four activities considered essential to the execution of a remedial action program The figure also indicates the primary responsibilities or functions of the Office of Environment and the Office of Nuclear Energy throughout the program. The first activity, site analysis, determines which sites need remedial action

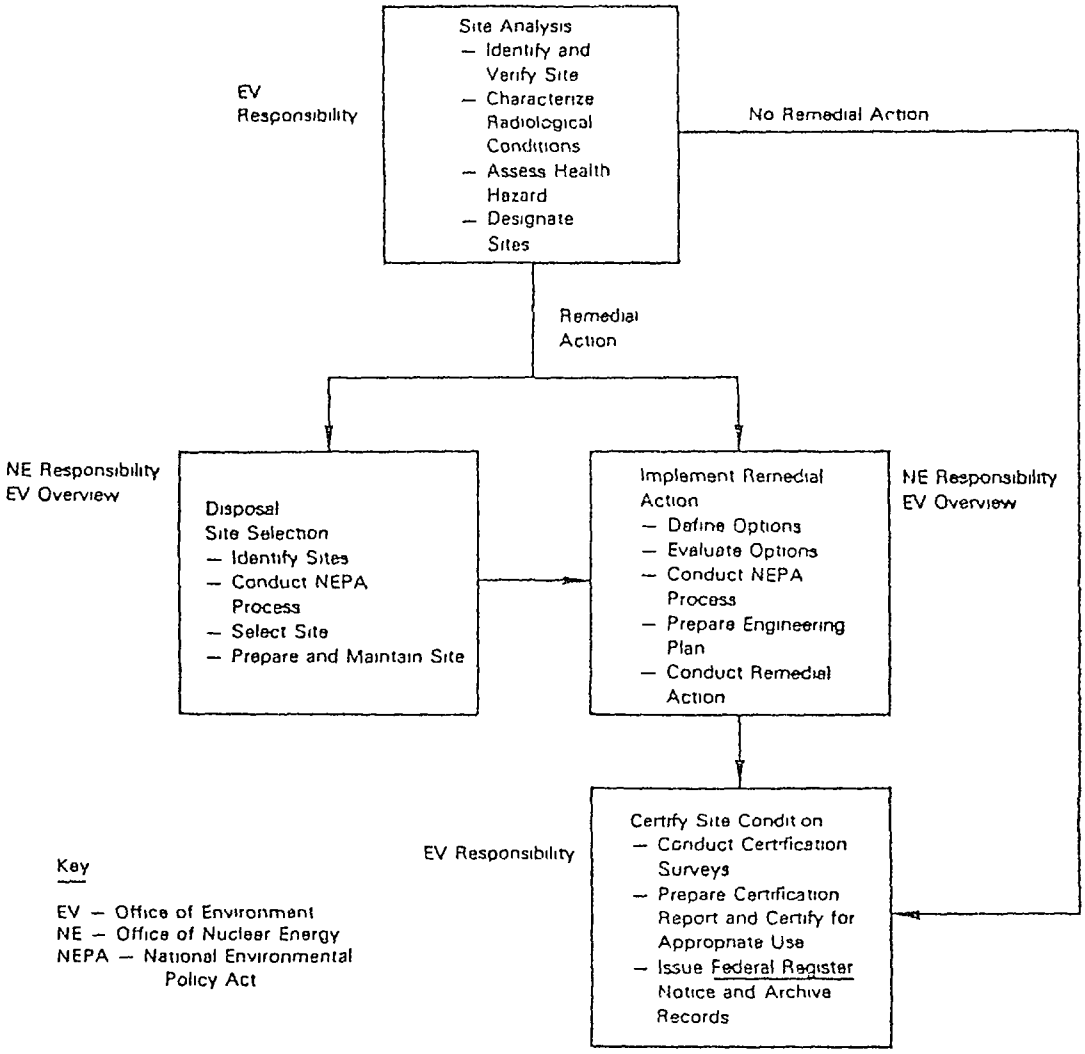

Figure 2 Formerly Utilized Sites - Basic Steps Involved in the Generic Plan

When remedial action is required, all four phases shown in Figure 2 are implemented If no remedial action is necessary, only the first and last phases are implemented A "Generic Program Plan for the Formerly Utilized Sites Remedial Action Program," now in draft, details the decision points and activities for accomplishing remedial action and identifies points where institutional activities must be completed before an action can progress A brief discussion of these phases follows

Site Analysis--This phase of the Formerly Utilized Sites Program involves two major activities. site identification and verification and site characterization The overall objective of the identification and verification step is to identify and locate all candidate sites and determine through the analysis of all available records whether there is any possibility that the site was exposed to radioactive materials as a result of operations conducted under contract to, or by the Manhattan Engineer District or Atomic Energy Commission

If there is adequate documentation to demonstrate that the site is not contaminated or that the site is presently operating under an appropriate license, no additional actions may be necessary If, however, the records are inadequate or indicate the site may be contaminated, efforts will be initiated to determine or verify the radiological condition of the site

Initially, a preliminary (screening) survey is performed Data from this survey along with available records from past surveys are used to determine the need for and the extent of a more comprehensive survey In some cases where earlier survey reports are adequate, only supplemental information may be required to characterize the site In other cases, no data are available and an exhaustive effort is required A complete radiological survey consists of the following elements

- Measurements of total or fixed and removable alpha and beta-gamma contamination on buildings and equipment surfaces
- Gamma-ray exposure rates
- Beta-gamma dose rates
- Alpha exposure rates
- Radionuclide contamination in surface water and groundwater
- Radionuclide contamination in building drains
- Radionuclide contamination in undergound drains and surface drainage ways
- Concentrations of surface and subsurface deposits of radioactive material

To place all measurements and results in the proper perspective, measurements of a similar nature are performed in surrounding control areas not affected by former Manhattan Engineer District or Atomic Energy Commission activities These results are used to represent the natural background radiation of the area

Aerial radiological surveys are performed in support of radiological assessments for both newly identified and previously recognized sites In the former case, they are used to indicate the need for and extent of ground surveys In the latter case, the main objective is the identification of any offsite contamination If the aerial survey indicates the presence of contamination not previously identified, the new area is surveyed from the ground.

When the survey work is complete, a report describing the radiological condition of the site is prepared The report (or report supplement) also includes an evaluation of potential radiation exposures from credible radiation-to-man pathways at the site The evaluation outlines the exposure levels to which humans could be subjected under present site usage These levels are compared to acceptable levels of exposure in order to place them in perspective Exposure evaluations are not performed at sites determined to be radiologically clean In cases where the possibility of radiation exposure above background is identified, summaries or the complete reports are submitted to the appropriate Federal, State, or regulatory authorities and the site, where appropriate, is designated to require consideration for remedial action Priority for remedial actions at the site are determined on the basis of health considerations

Discussions are held with property owners and, where applicable, with concerned agencies to explain the results of the survey and future Department of Energy plans Press releases may also be used to ensure that the public is informed of the survey results

Implement Remedial Action--Once a site is designated as requiring consideration for remedial action, options for such actions are evaluated If the evaluations demonstrate that a remedial action is required and if the Department has authority, an appropriate remedial action is selected and implemented The major elements of this activity include the following

- An Engineering Evaluation is conducted to identify and assess the remedial action options on a technical and economic basis The evaluation will consider the area's hydrology, geology, meteorology, and so forth along with preliminary engineering estimates for the quantity of material to be removed, the time required for completion of the actions, the boundaries of the action, and approximate costs of each remedial action option

- An Environmental Analysis is completed to compile pertinent environmental data and provide an environmental evaluation of the remedial action options identified in the engineering evaluation The evaluation will cover the environmental impact of status quo, stabilization of material onsite, and decontamination and removal of material to a disposal site

- The National Environmental Policy Act Process is implemented to ensure that all environmental factors have been considered and adequately addressed in selecting and conducting the remedial action. The data developed for the environmental analysis, along with any necessary additional data, are used in the preparation of an environmental assessment or an environmental impact statement, when required. The National Environmental Policy Act documentation is prepared in accordance with the Council on Environmental Quality National Environmental Policy Act Regulations (Title 40, Code of Federal Regulations, Parts 1500-1508), the Department of Energy guidelines for compliance with the National Environmental Policy Act (Federal Register, Vol 45, No 62, March 28, 1980, pp 20694-20701), Department of Energy Order 5440.1, the Department of Energy Environmental Compliance Guide, and other internal guidance.

- The Selection of a Remedial Action is made following the completion of the Engineering Evaluation, the Environmental Analysis, and the National Environmental Policy Act process. The decision will be based upon technical, environmental, and economic considerations and will be coordinated with State and local governments as well as other Federal agencies.

- An Engineering Plan is prepared to define the scope, specifications, and details of the remedial action that is selected. The plan presents workplans, schedules, specifications, and detailed cost estimates to be used to conduct the remedial action.

- The Remedial Action is conducted to resolve any actual or potential problems associated with residual radioactivity resulting from former Manhattan Engineer District and Atomic Energy Commission activities. The remedial action is conducted as outlined in the engineering plan. The Department of Energy monitors the action on a radiological, environmental, engineering, and contractual basis and reviews periodic status reports.

Disposal Site Selection--The objective of this phase is to identify a terminal disposal site for wastes from remedial actions at formerly utilized sites. There are two basic generic options for any required offsite disposal that will be evaluated during this process.

- A disposal site within the state where the wastes are located.

- A centralized regional disposal site for wastes from remedial actions located within the region of the involved states.

The selection of a disposal site would probably be necessary only for the first formerly utilized sites undergoing remedial action in a state or region, assuming that offsite disposal is required. Waste generated during subsequent

remedial actions at other sites in the state or region would likely be sent to the existing disposal facility The choice of a remedial action depends on details such as cost and environmental analyses, which are highly dependent on the selected disposal site The basic elements of this activity are as follows

- Disposal Options are identified and evaluated to determine a number of specific locations that are candidates for use as disposal sites for remedial action wastes The Department of Energy will work with State and local governments, as required, possibly through the establishment of siting committees

- A National Environmental Policy Act review is conducted to ensure all practicable alternatives will be evaluated with respect to their environmental impacts The National Environmental Policy Act process will be conducted as outlined above in the implement remedial action activity The Nuclear Regulatory Commission or agreement state licensing process will be initiated in parallel with this step *

- An Engineering Plan is prepared for the disposal site and will contain detailed plans and specifications for developing the site The plan will present costs, work plans, and schedules suitable for use in preparing a request for proposal for site development and maintenance

- Disposal Site Preparation and Maintenance includes surveillance of the site before and during operation and will continue after site closure The maintenance and surveillance procedures will be developed on a site-by-site basis and will depend on both waste and site characteristics The maintenance and surveillance of the disposal site will be conducted by the licensee or operator in accordance with the followup procedures specified in the environmental impact statement and the Nuclear Regulatory Commission license

* In accordance with the provisions of the Atomic Energy Act of 1954, as amended, the sites selected for permanent disposal of wastes from the formerly utilized sites will be subject to licensing by the Nuclear Regulatory Commission or an agreement state When proposed disposal sites have been selected, preliminary evaluation of the licensing and regulatory requirements will be initiated in parallel with initiation of the National Environmental Policy Act process The licensing process will continue through subsequent disposal site selection, engineering, and design steps, with the requirement that a license be issued by the Nuclear Regulatory Commission or the appropriate agreement State agency before waste disposal commences

Certify Site Condition--During and upon completion of any required remedial action, an independent radiological survey is performed to verify that the levels of residual radioactivity meet criteria for unrestricted or proposed limited use The public is informed by Federal Register notice of the completion of the remedial action The survey report and other pertinent site records are then reviewed by a Certification Committee, and if appropriate, the site is released for unrestricted use In the event that effective measures cannot be found to reduce residual radiation to levels defined by criteria for unrestricted use, the condition of the site is documented and the site placed under appropriate control The control may involve restricted land use, such as making the area into a park where no permanent structures may be constructed, or possibly licensing the site in cases in which it is still used for nuclear activities

In all cases, upon completion of the decontamination efforts, a final report is prepared documenting the entire remedial action effort and the final radiological condition of the site This report also notes the quantity of material removed from the site and its disposition. The final report and all supporting documentation are stored in Government archives Complete copies or summaries are also placed on file at appropriate local centers such as public libraries and state and local government planning or record offices.

Certification procedures are similar for sites where no residual radioactivity is identified during the site analysis phase (i.e , sites not requiring remedial actions) The certification committee reviews the available data and survey reports and if sufficient information exists to certify the site for unrestricted use, the findings are documented in the same manner as described for the certification of a site where a remedial action has been completed However, if the data are not sufficient, then additional records searches and/or radiological surveys are conducted as necessary

IV. SITE-SPECIFIC SUMMARIES

This section provides a brief summary of the history and current status of 71 formerly utilized sites that required evaluation by the Environmental and Safety Engineering Division to determine their radiological condition In addition, three sites controlled by the Department of Energy (Weldon Spring Site, St Charles County, Missouri, New Brunswick Laboratory, New Brunswick, New Jersey, and the Department of Energy Niagara Falls Storage Site,* Lewiston, New York) and used by the Atomic Energy Commission are summarized for completeness The former Vitro Rare Metals Plant at Canonsburg, and an associated property in Burrell Township, Pennsylvania, are former Manhattan Engineer District and Atomic Energy Commission sites, however, they have now been included in the Inactive Uranium Mill Tailings Remedial Action Program The Environmental and Safety Engineering Division is currently reviewing information concerning other formerly utilized sites that may eventually require survey work; however, as of this printing, there are insufficient data to include other sites in this document A supplemental report will be prepared for these additional sites when information is available

The objective in preparing the site summaries was to produce a synopsis of the operations and radiological conditions at each of the sites, based on the best information available at the time, to document program status at each site The summaries are not intended to be comprehensive site histories Ideally, each site summary should follow the basic outline shown below, supplying specific information in several categories.

- Name of Site**
  - Current name of facility or owner
  - Name of facility or owner during Manhattan Engineer District or Atomic Energy Commission use
  - Location
- Site Function
  - Use
  - Dates of operation

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* This facility was once part of the portion of the Lake Ontario Ordnance Works that was used by the Atomic Energy Commission The Department of Energy now controls only 191 of the original 1511 acres.

** It should be noted that the name usually refers to a company or facility and that typically only a small part of the overall area was used for Manhattan Engineer District or Atomic Energy Commission operations The specific location of the contamination is given in the site description section

- Operator, if different from owner
- Contract number(s) during Manhattan Engineer District or Atomic Energy Commission operations

- Site Description
  - Physical layout during use
  - Remains of the old site
  - Any changes in physical characteristics of the site and their cause(s)
  - Description of any offsite location(s) affected

- Owner History
  - History of ownership from the initiation of operations to the present

- Radiological History and Status
  - Radiological history (including decontamination and surveys performed) from the initiation of operations to the present
  - Disposition of any potentially contaminated equipment or materials removed from the site during Manhattan Engineer District or Atomic Energy Commission operation or during subsequent decontamination
  - Current status
  - Magnitude of any contamination onsite and offsite
  - Any actions taken to decontaminate the site and release it for public use, the acting party, and the date
  - Any need for further action

Although attempts were made to collect all of the information discussed above, one or more of the items could not be adequately addressed for most of the sites In addition, the disposition of materials and equipment from most of the identified sites has still not been completely ascertained There is an ongoing effort to identify the current location and radiological condition of such materials and equipment

These summaries have been reviewed by the owners and/or former owners, State representatives, representives of the involved national laboratories, and cognizant Atomic Energy Commission employees These groups and individuals have been instrumental in providing information on the sites Additional information from these and other sources is being investigated as received

Figure 3 shows the approximate locations of the formerly utilized sites outlined in this report In addition, a state map showing more exact locations of all sites described is presented at the end of each state section

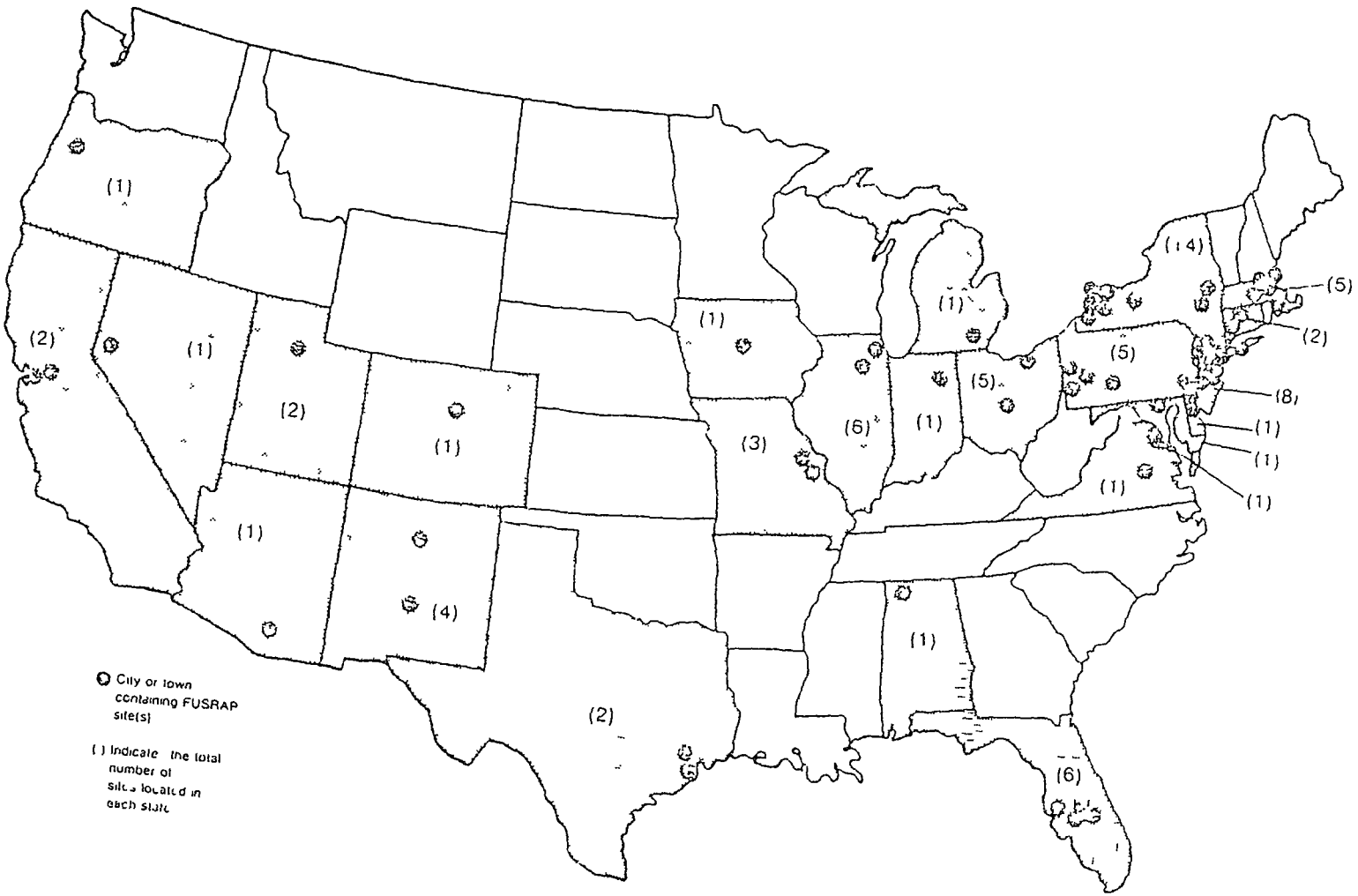

Figure 3 States Containing Sites Formerly Utilized by the Manhattan Engineer District and the Atomic Energy Commission and Related DOE Sites Discussed in This Report

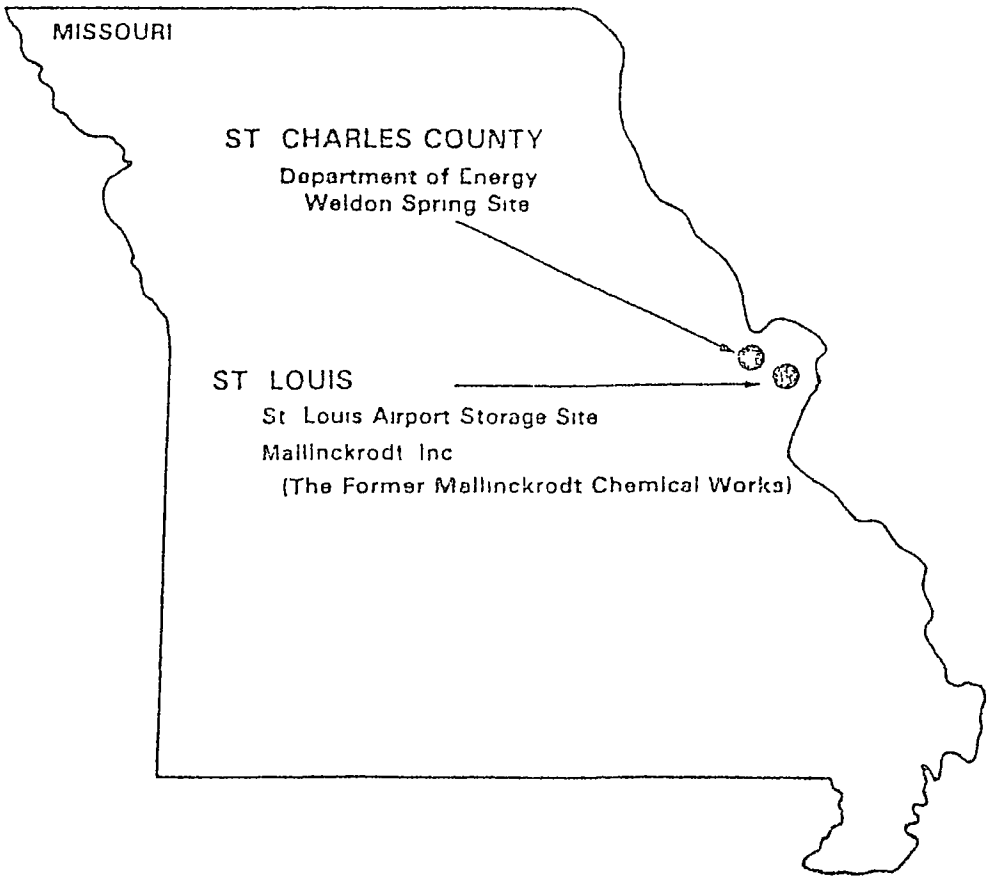

Figure 19 Formerly Utilized Sites in the State of Missouri

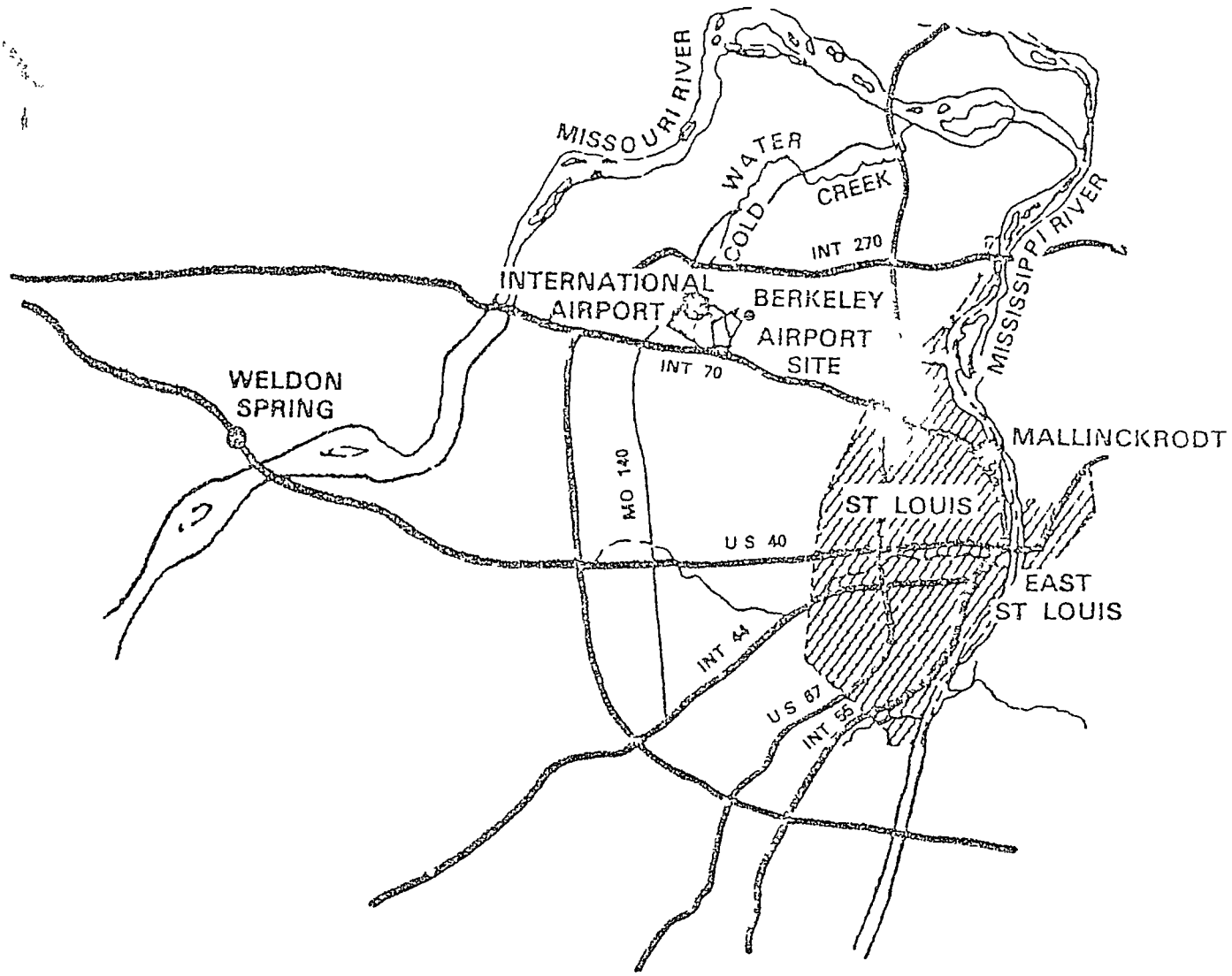

Figure 18. Location of Mallinckrodt Property

MALLINCKRODT, INC
(The Former Mallinckrodt Chemical Works)
St Louis, Missouri

Site Function

In April 1942, the Army requested Mallinckrodt Chemical Works to set up an industrial-scale process to produce uranium dioxide and uranium trioxide Mallinckrodt had the process operating by early summer 1942 The company was the sole source of purified natural uranium compounds until well into 1943 and processed all of the uranium used in the world's first self-sustaining nuclear reaction on December 2, 1942, at the University of Chicago Mallinckrodt provided uranium compounds and uranium metal for use in the research, development, and production programs of the Atomic Energy Commission Work also included (1) production of uranium tetrafluoride (UF_4), (2) production of uranium derby metal (subsequently vacuum recast to form purified ingot metal), (3) machining of uranium metal rods for reactor fuel slugs, (4) reversion of uranium tetrafluoride to UO_2 or U_3O_8, (5) recovery of scrap uranium metal, (6) production of UO_2F_2, (7) extraction and concentration of thorium-230 from pitchblende raffinate, and (8) experimental processing of very low enrichment UF_4 The St Louis Airport Storage Site was used for storage and disposal of residues from Mallinckrodt's St Louis operation By the conclusion of Mallinckrodt's 24 years of uranium-processing work in 1966, the company had processed over 100,000 tons of purified natural uranium products at facilities in St Louis and Weldon Spring, Missouri Contracts with Mallinckrodt included W-14-108-Eng-8, AT-(23-2)-44, W-7405-Eng-1, W-7405-Eng-8, W-7405-Eng-13, and W-7405-Eng-29

Site Description

Mallinckrodt leased portions of two locations (Broadway Street (main plant and Plant 4) and Destrehan Street) to the Manhattan Engineer District, primarily for the processing of uranium concentrate From 1942 through 1945, uranium processing was done exclusively at the Broadway Street location, and some uranium metallurgical research continued at Plant 4 through 1956. From 1945 to 1957, uranium ore or concentrate was processed in buildings at the Destrehan location In 1957, all operations at Destrehan were terminated and transferred to a new Atomic Energy Commission feed material processing center that Mallinckrodt operated in Weldon Spring, Missouri About 20 existing buildings on the Mallinckrodt property at Broadway and Destrehan, plus their surroundings, were subject to radiological contamination Figure 18 shows the general location of the facility in St Louis

Owner History

The subject property is owned and operated by Mallinckrodt, Inc (formerly Mallinckrodt Chemical Works)

Radiological History and Status

From 1948 to 1950, the main plant property was decontaminated, and final decontamination surveys were performed In 1951, the main plant property was returned to Mallinckrodt for unrestricted use Between 1957 and 1962, the Destrehan properties and Plant 4 were also decontaminated, surveyed, and released for unrestricted use In the process, some of the buildings were removed to the Atomic Energy Commission waste disposal sites Contaminated earth was also removed and backfilled Decontamination wastes, scrap, and rubble from these operations were buried at the west end of the St Louis Airport Storage Site and also deposited in an abandoned quarry at Weldon Spring Decontamination procedures were supervised by the New York Operations Office early in the program and by the Oak Ridge Operations Office during the Destrehan and Plant 4 decontamination The Atomic Energy Commission decontamination activities did not reduce radioactivity levels to background but reduced them to prevailing permissible levels for unrestricted use

Oak Ridge National Laboratory conducted a new radiological survey of the former uranium processing areas during the summer of 1977 Alpha and beta-gamma contamination levels inside and outside some of the buildings were above limits set by current Federal guidelines concerning the release of property for unrestricted use * Elevated external gamma radiation levels were measured at some outdoor locations and in some of the buildings Quantities of uranium in an amount that may require licensing were found in soil at some places, and the concentration of uranium in one water sample taken from an old waste pit was in excess of Federal standards ** Radon and radon-daughter concentrations in three buildings were in excess of current Federal guidelines for nonoccupational radiation exposure

On February 15, 1980, the Office of Environment notified the Office of Nuclear Energy that the Mallinckrodt, Inc , site required consideration for remedial action. The Office of Nuclear Energy is currently in the process of determining and reviewing remedial action options

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* "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material," U S Nuclear Regulatory Commission, November 1976

** Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation

ST LOUIS AIRPORT STORAGE SITE
St Louis, Missouri

Site Function

The site was used as a storage area for waste generated by the Mallinckrodt Chemical Corporation during its uranium processing operations from 1946 to 1953 This waste or residue was stored at the site until 1967

Site Description

The storage site is a 21 7-acre tract of land in St Louis County, bordered on the north and east by Brown Road, on the south by the Norfolk and Western Railroad and the Airport, and on the west by Coldwater Creek

Owner History

This site was acquired by the Manhattan Engineer District in 1946 Since 1965, access to the site has been controlled by the Airport Manager, thus barring casual entry A permit, dated November 10, 1969, authorized the St Louis Airport Authority to enter upon, use, and occupy the site for the purpose of undertaking certain decontamination work The city of St Louis Airport Authority acquired this site from the Atomic Energy Commission through General Services Administration (GSA) transfer (deed GS-06-DR-(5)-9-0085), effective June 8, 1973 The deed contains a restriction on the use of the property because residual radioactive materials remain onsite

Radiological History and Status

The Atomic Energy Commission conducted a radiation survey of the Airport Site in 1965 Contamination was found on structures and at various locations and depths within the soil During 1966 and 1967, residues were sold for processing and removed from the site The removal of the residue resulted in decontamination of the site, restoring it to a condition where the radiation level at the ground surface was less than 1 mrad/hour except for an area where barium sulfate residue was located This area was about 3 mrad/hour

The St Louis Airport Authority agreed to decontaminate this property as stated in the acquisition permit, dated November 10, 1969 An agreement with the Federal Government required that the barium sulfate residue be removed to an interim storage site at Weldon Spring, Missouri, and that all structures onsite except the fence be razed Also, a minimum of 1 foot of clean fill was to be placed over the entire site This work was performed during the period from January 1969 through December 1969 under procedures developed and monitored by the St Louis Health Department as approved by the Atomic Energy Commission

In January 1970, a radiation survey identified radiation levels above background at 11 points Additional fill (2 to 3 feet) was placed over these areas to achieve acceptable radiation levels

The Atomic Energy Commission conducted another radiation survey in November 1971 to document radiation levels over the entire site Ground surface dose rates were generally less than 0 05 mrad/hour Certain isolated areas were found to exceed 0 2 mrad/hour and were documented No area was found to exceed 1 mrad/hour

During the week of November 14, 1976, Oak Ridge National Laboratory performed a comprehensive survey of the site to characterize the existing radiological status of the property The survey report indicated that the contaminated soil in the western section of the site represents a potential source of radiation exposure At the time when some of the stored material was sold and removed, some remaining barium sulfate cake residue was covered with fill At the present time, most of the contamination remains covered with earth in varying thicknesses, however, this earth cover has eroded up to 3 feet in some places In one small area of the western section, above-background readings were obtained in numerous places Samples of soil were collected from various points within the site and, at 26 points, a concentration of radium-226 was found to be in excess of the maximum level for background concentrations observed in Missouri An analysis of groundwater revealed measurable quantities of several nuclides. Radionuclide analysis of surface water and sediment samples showed levels near background in most cases

The St Louis Police Department is planning to develop this site for use as a driver training course, with due consideration to the restrictions in the deed The Nuclear Regulatory Commission has also proposed that contaminated material from the formerly licensed Latty Avenue* property located in Hazelwood, Missouri, be relocated to the airport site The Department of Energy is evaluating the environmental and engineering impacts of this proposal

On October 26, 1979, the Office of Environment notified the Office of Nuclear Energy that the St Louis Airport site required consideration for remedial action The Office of Nuclear Energy is currently in the process of determining and reviewing remedial action options

* Latty Avenue is a former uranium processing site that is under the jurisdiction of the Nuclear Regulatory Commission

WELDON SPRING SITE*
St Charles County, Missouri

Site Function

The Department of Energy's Weldon Spring site consists of two separate properties One of these properties is the raffinate pit area, which contains four pits constructed and used for the storage of wastes generated from the adjacent Atomic Energy Commission Uranium Feed Materials Plant (the plant area is now controlled by the U S Army) Mallinckrodt, Inc , operated this plant for the Atomic Energy Commission from 1957 until 1966 Some processing of thorium residues was also performed at the plant The other property is an abandoned quarry located approximately 4 miles southwest of the raffinate pit area, The quarry was first used by the Atomic Energy Commission in 1959 when drummed residues containing about 3 8 percent thorium were dumped there In 1963 to 1964, approximately 50,000 cubic yards of uranium- and radium-contaminated rubble from the demolition of the Destrehan Street plant were deposited in the quarry Additional drummed thorium residues containing about 3 percent thorium were deposited in the quarry in 1966 During the decontamination of several of the buildings selected for herbicide production in 1967, the Army deposited approximately 6000 cubic yards of contaminated and unrecoverable material in the quarry (The herbicide production proposal was later put aside) Prior to the Atomic Energy Commission, the Army also used the quarry for disposition of trinitrotoluol-contaminated rubble during the operation of the Weldon Spring Ordnance Works Plant

Site Description

The raffinate pit area occupies approximately 51 acres and is totally surrounded by Army property Pits 1 and 2 are filled with residues within 3 feet of the top of the levees and Pit 3 is approximately 78-percent filled with residues The residue fill in Pit 4 is quite irregular with about 10 percent of the total pit volume consumed Approximately 70 percent of the residues discharged to Pits 1, 2, and 3 were neutralized raffinates from refinery operations The remaining 30 percent of the residues consisted primarily of washed slag residues from the uranium metal production operation In addition to some uranium residues similar to those in Pits 1, 2, and 3, Pit 4 contains raffinate solids from the processing of thorium recycle materials Some minor amounts of thorium are also present in Pit 3 The raffinate pit area is fenced with standard 7-foot chain-link cyclone fence topped with three strands of barbed wire Access to the pits is obtainable solely through the road system and security gates of the Army-owned areas

* This site is a DOE-owned Surplus Facility It is included in this report because it was formerly utilized by the Atomic Energy Commission for processing activities

The abandoned quarry consists of approximately 8 acres and is located between Missouri State Route 94 and the Femme Osage Creek in a relatively remote location The main quarry hole area is about 2 acres with about 1/2 acre consisting of a pond or sump. The quarry is fenced with a 7-foot cyclone fence similar to the raffinate pit area, and signs are clearly posted indicating the presence of radiological material. The general location of Weldon Spring with respect to other Missouri sites is shown in Figures 18 and 19

Owner History

In 1956, approximately 220 acres of the original Weldon Spring Ordnance Works Plant were acquired by the Atomic Energy Commission from the U S Army for use as a uranium feed materials plant The Atomic Energy Commission acquired the abandoned quarry in 1958, also from the Army After the Feed Materials Plant was shut down in 1966, the Army reacquired the land and facilities, except for the 51-acre raffinate pit area and the quarry, to use portions of the plant facilities for the production of herbicide orange However, the project was never implemented and the property was declared excess in 1970 The General Services Administration determined that the land could not be released because of the degree of radioactive contamination Both the raffinate pit area and the quarry are under the control of the Department of Energy, but the remainder of the property is still under Army control

Radiological History and Status

Since about 1967, the National Lead Company of Ohio, under contract with Oak Ridge Operations Office, makes periodic visits to the raffinate pit area for environmental control sampling Necessary security and maintenance such as fence repair and grass-cutting is performed, under agreement, by the Army personnel located onsite The pits are uncovered and represent a potential quicksand hazard, however, access is restricted by the 7-foot fence and the area is completely enclosed within the boundary of a U.S. Army facility Beta-gamma radiation measurements at a point about 1 foot above the sludge were above background Air samples taken around the pits have shown no short- or long-lived airborne activity that could be attributed to the pits Test holes drilled in the area have shown neither lateral seepage of effluents nor selective migration of radionuclides from the raffinate pits Data obtained from the analyses of samples of effluents and storm drainage from the pit area indicate that uranium and other radiological contaminate concentrations are within Nuclear Regulatory Commission concentration guides for uncontrolled areas *

The Department of Energy is currently negotiating with the Cotter Corporation of Canon City, Colorado, for the removal of the raffinates from the pits An Environmental Assessment, DOE/EA-0031, has been prepared

* Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation

covering the transfer of title of the raffinates to the Cotter Corporation The Department is also investigating other alternatives for disposition of the raffinates and pits

Data obtained from samples collected by National Lead of Ohio at the quarry in 1975 and 1976 indicate that uranium and thorium concentrations in the quarry pond are above background but within Federal guidelines for water in controlled areas * Water in the Femme Osage Slough, although at lower levels, is also above background, and this appears to confirm the existence of a hydraulic connection between the quarry and the Slough Samples of incoming water to the St Charles waterworks well field indicate that no contamination of the well fiel[illegible] however, due to the proximity of the well field to the quarry and [illegible]e Osage Slough, contamination could be a matter of potential conc[illegible] [illegible] where Berkeley Labs 7-1-80 report on page 110 states "2 samples from slough contained 20 times background. this is less than 7 of mile from St Charles County well field

Some form of remedial action is required at this site Removal of the raffinate from the pits (possibly by Cotter Corporation for reprocessing) is required and may be followed by decontamination of the pits themselves The disposition of the quarry must also be addressed Meanwhile, monitoring of the site will continue, and a radiometric aerial survey is planned for fiscal year 1980 1975

Cotter was going to dump water into Mo river / Teasdale stop it.

The Department of the Army has requested that the Department of Energy accept the transfer of the 169-acre Weldon Spring Chemical Plant as they have neither the funds nor the expertise to decontaminate the property The Department of Energy is evaluating the proposal along with other options.

The Army Property is a disaster area Barrels of Uranium dioxide & tetrafloride are sitting on bare ground in North dumps areas. On Army reserve land there is a 10-20 acre tract listed as contaminated trash in Army Asses '76 pg. 193. Personnel familiar with area say area contained all equipment, trucks, tools etc, even a steam locomotive that were radioactive contaminated. This location is on a plateau, that rain runnoff washes into Busch Wildlife!

A serious concern is the probable seepage of radioactive materials in Raffinate pits into ground water. Please obtain this Report. USGS. report "The contamination of ground & surface waters by liquid wastes from the Weldon Spring Ordnance Works, Mo. by V C Fishel & C C Williams Lawrence Kan. Jan 1944

* Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation

See pages 2, 24 & 25 & 28 especially.

This study was done on red water wastes in 1941-42 which acted as a dye study. The ground & ground water has not changed in 35 yr. I checked with geologist Jim Williams & he concurs. If that site leaked like a sieve in 1941-42 — what's to stop it from doing so the last 35 yrs. Hence the need for well testing